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ISAAC

Integrated e-Services for Advanced Access to
Heritage in Cultural Tourist Destinations

FP6-IST-2006-035130

ISAAC Project Deliverable 2.1

Report on ISAAC User Requirements for e-services and architecture

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DEFINITION OF RESPONSABILITIES

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Abstract

This report results from the activities carried out in ISAAC's Task 2.1 "Revision of Users' needs". The task aimed to analyze in details the application of the ISAAC reference framework developed in Task 1.1 "Review of the current digitization issues and cultural data interpretation in the chosen cities" and Task 1.3 "Developing alternative platform scenarios". The objective of this analysis is to summarise the main findings regarding the user requirements to support the specifications of the ISAAC ICT architecture and e-services in task 2.2 "ISAAC e-services and architecture specifications".

The current report is based on the results of the two preceding tasks: Task 1.3 identified feasible and innovative ISAAC e-services and alternative scenarios deriving from the combination of these e-services to feed into the ISAAC ICT platform using focus groups studies of the main stakeholder groups in the three partner cities; Task 1.1 carried out extensive survey and case study work, which identified key stakeholder considerations in a wide range of tourism and cultural heritage e-services in more than 150 European cities, heritage institutions and Destination Management Organisations. The latter have further enriched the study of the user perspectives concerning the development of a novel ISAAC platform in the context of competitive and sustainable tourist (e)-destinations. The present report summarises and prioritises the user perspectives from ISAAC's specific objectives.

In summary, the results of this study will serve a two-fold aim: First, the findings will support the development of the novel ISAAC e-services based on the stakeholder-relevant needs, and second – they will enable the improvement of the prototype in case of further resources. This report can therefore be regarded as a feasibility study of the ISAAC prototype including multimedia capabilities and limitations. A preliminary analysis of each ISAAC e-service includes an assessment of its technical feasibility, resource base, scalability, user-interactivity, and effectiveness of the intelligence feedback system. In conclusion, the key technical challenges of the ISAAC's ICT platform are outlined and the main functions of the ISAAC e-destination portal are laid out.

1 Introduction

1.1 Document Overview

This document is organised in four different chapters:

- The introductory chapter summarises the objectives and the purpose of the work that led to the development of this report.
- The second chapter provides a general introduction to the ISAAC platform including the research challenges identified in the Description of Work of the project. This part of the document aims to provide the reader with some key notions that ISAAC builds on and which will help him understand the user requirements' analysis presented in the next chapter of the report.
- Chapter 3 is the core of this report, aiming to analyze the user requirements gathered in ISAAC's Work Package 1 "Developing the framework: E-heritage and cultural tourism services". In it, the foundation for the design and development of the ISAAC integrated ICT platform is laid out. The roadmap that is outlined includes a preliminary analysis of the identified e-services and multimedia capabilities of the prototype in terms of feasibility, usability, resources, scalability, user-interactivity, and effectiveness of the intelligence feedback system. The later will play a key role in the future project's developments.
- Finally, the concluding section sums up the main results deriving from the user requirements analysis in the centre of this report and outlines the future technical challenges to the ISAAC's ICT Platform and e-destination portal.

1.2 Purpose of this document

This document is the result of the activities performed during the Task 2.1 "Revision of Users' needs". This task aims to analyze in details the application of the reference framework obtained from the Task 1.1 "Review of the current digitization issues and cultural data interpretation in the chosen cities" and Task 1.3 "Developing alternative platform scenarios".

The work developed within Task 1.3 aimed to suggest feasible and innovative e-services and possible scenarios given by the combination of the identified e-services to be provided by the ISAAC platform.

These scenarios will be considered and assessed in Task 1.4 using a conjoint analysis approach and will serve as the base for the architecture and e-services design and specification in Task 2.2.

Besides the focus groups studies in 1.3, the results of Task 1.1 have a stronger reference to the Task 2.1 outlines. In fact, the survey and case study work in 1.1 has explored stakeholder considerations in a wide range of tourism and cultural heritage e-services but also of tourist destinations - cities and DMO, not explicitly in the focus of 1.3 but that have to be taken in consideration for the development of a good and innovative ISAAC platform.

Because of the above-mentioned references, the focus of the Task 2.1 is the analysis of the results of both Task 1.1 and Task 1.3. The objective of this analysis is to extract the main findings that will allow preparing the design specifications (D2.2 “Report on ISAAC e-services and architecture specifications”) for the future development of the ISAAC ICT architecture and the e-services to be realised, starting from the users needs gathered during the activities performed in the Work Package 1.

Next steps on that direction will be to translate the results obtained from this report in term of service, technology and heritage interpretation preferences in the detailed specification of the ISAAC integrated platform. The different implementation scenarios will be identified according to the Task 1.4 results, while the content management issues in term of taxonomy of cultural heritage goods will be analysed and designed starting from the results of the Task 1.5.

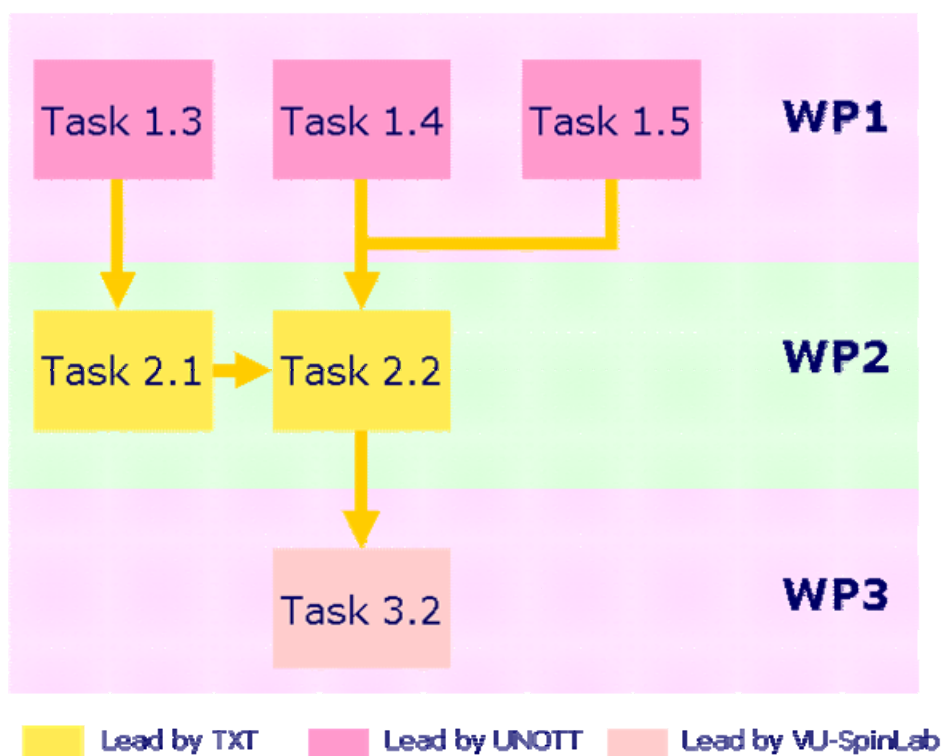


Figure 1: Task 2.1 Dependencies

This report therefore will prioritize all user requirements in order to be able to create a development roadmap based on time and resources available in the project.

The result will be twofold:

- first to ensure the development of proper services based on real needs
- second to be able to improve the prototype in case of further resources

Thus, this deliverable can be considered a feasibility analysis of the ISAAC prototype including multimedia capabilities and limitations. A preliminary analysis of each service to be implemented in ISAAC integrates the development roadmap in terms of resources, scalability, user-interactivity, and effectiveness of the intelligence feedback system.

The work performed during the Task 2.1 has been organised according to the following schema:

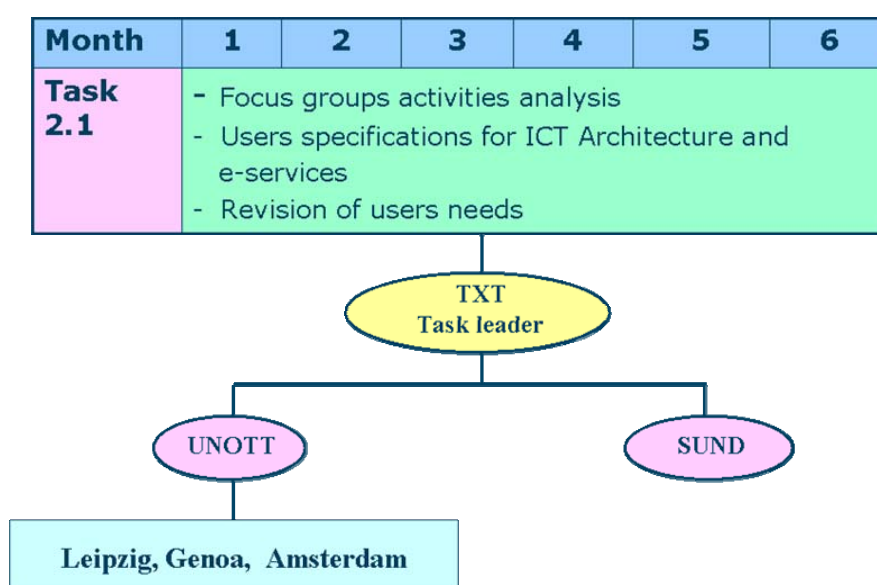


Figure 2: Task 2.1 Work Organization

This revision and analysis of the user requirements have been based on the following research parameters:

- Service Preferences
- Technology preferences
- Heritage interpretation preferences
- (e)Governance preferences
- Access, Ease of Use and influence on Inclusion
- Knowledge Transfer and Education

- Business needs

According to these criteria, some major challenges have been identified:

- Identify novel e-services in cultural tourism that enhance access and promote local heritage in the three cities involved
- Identify a new business model for ISAAC e-services (organization, management and policy)
- Identify e-services targeting specific user groups
- Design and imaging the ISAAC web portal accessible for all cities interested and integrating all the identified e-services

Next steps in the Work Package 2 and in particular during the Task 2.2 (“ISAAC Architecture and e-services Specification”) will be to define the architecture and e-services specification of the ISAAC platform, following the different scenarios that will be identified in the Task 1.4 “Defining users’ requirements: assessing competitiveness “ for Amsterdam, Genoa and Leipzig.

2 General overview of the ISAAC platform

The main objective of the ISAAC project is to valorise the relationship between digital heritage and cultural tourism.

The main ISAAC technology innovation challenges are:

1. Mobile technologies: ISAAC will use the potentials of mobile technologies for enhancing the links between local heritage and tourism, since smart mobile vices can accompany the tourist all along her/his tour path, providing the right information at the right moment. For ISAAC, mobile devices will host innovative creative applications (e.g. games involving tourist, who have to discover the richness of the territory, and local citizens, who may act as wizards/advisors, etc.)
2. Smart agent technologies: will significantly enhance the ability of a user to get relevant information from the web. Intelligent agents are already able to surf the web to get information according to the owner's profile. Further advances will involve enhanced proactivity (i.e. capacity to anticipate the owners' needs); automatic brokerage based on a common ontology, and enhanced understanding of human situations.

ISAAC project's innovation shall:

- Create a virtual repository for the collation of a large amount of information, with a reliable and secure framework, distributed among many sources within a common hypermedia structure.
 - Maintain relationships between cultural goods (and the information directly related to them) and other relevant pieces of information, stored using pathways and links. Continual analysis will be carried out on the information base, using knowledge modelling techniques adopted by the intelligent agent and the behaviour of tourists, researchers and other user groups.
3. Worldwide Adoption: The development of flexible, portable and powerful new technologies, led for the most part by European innovation, has led to a greater potential for a wide user-group. As hardware becomes cheaper and more accessible to the non-IST-literate individual, there is a greater need to provide services and applications through user-friendly interfaces to further increase this potential.

ISAAC's innovation objectives related to this area are:

- To create a system with which users can experience the advantages enjoyed by tourists without visiting the physical locations concerned. This will not only assist social and cultural inclusion, but also enhance engagement with cultural heritage and thus enhance empathy, willingness to conserve, and visitation generally.
 - To provide a [great] vital service to researchers in that relevant and practical links are provided between related pieces of information. In turn, the intelligent technology and reasoning components will track links created as part of the research journey, adding to the overall intelligence structure.
 - To develop associations and harmonisation between cultural heritage sites, resulting in commercial and academic gains for those in collaboration.
 - To provide a common framework for all users standardizing the interface and representational characteristics of a large variation of cultural heritage attractions, environments [areas] and goods.
4. Context-based knowledge handling and Intelligence: the power of IST systems for adoption by the wider user-group can be based in terms of their flexibility in adapting themselves to varying personalities, environments and behaviours. This, especially for ISAAC objectives, requires a level of intelligence, which static systems cannot provide. Intelligent systems are required which react and adapt to usage, and use cognitive reasoning to analyse behavioural data, either at the macro or micro level.

Therefore, ISAAC targets to innovate by means of:

- Apply knowledge modelling and cognitive reasoning techniques to the information base to create links between context-associated information to support either manual or automated decision-making processes.
 - Maintain links between cultural goods and information throughout the information base using links gathered through analysis of the activities (tourist or research) taking place during use of the system.
 - Allow User Profiling and individual customization maintenance to be controlled by the intelligent agent system.
5. Mobile / Wireless full multimedia: Europe is one the main leaders in providing high-tech, reliable communication and embedded software technologies. Many of the telecommunication companies are embracing the new generation of mobile software and hardware, and are set to lead the market with the production of these.

On this basis, ISAAC opportunities to innovate are targeted towards:

- The creation a framework extending interface components from common PC-based applications to homogeneous machine-independent platforms, for each level of the interface; software- (e.g. Web-browser), operating system- and machine-level.
- Apply state-of-the-art techniques used in mobile agent technology to allow necessary intelligence feedback for individual users or organizations to be independent of location.

To address these challenges, ISAAC aims to develop a novel user-centric ICT environment based on new e-services and new integrations of existing e-services meeting the needs of all cultural stakeholders: citizens, tourists, private and public entities.

The ISAAC ICT architecture will be designed and realized in order to incorporate all stages of the cultural tourism experience:

- Pre-visit: during this phase the user can plan all details of the cultural experience he is going to live
- Visit: this phase represents the cultural experience itself
- Post-visit: During this phase, the users can share their experiences with other people via chat, forums, blogs, image and video sharing, etc.

Such a platform allows users to follow the whole cultural experience life cycle by creating their own identities. This adds value to the experience itself by making users better imaging, sensing and appreciating the destination before, during and after the visit.

The concept at the base of these principles is that ISAAC aims to allow users to stick with the pure material depiction of a city but mainly, ISAAC wants to help people to catch the soul of a city. Catching the soul of cultural goods requires applications that can be forced not only to the city's own wills, but also to the visitor's own wills. This concept makes understandable the fact that ISAAC needs to merge requirements of tourists, citizens and stakeholders of a cultural tourist destination, helping improvement of the city destination competitiveness by providing services that allow a better promotion and an easier electronic access to the cultural sources of the city.

Therefore, the main goal of the ISAAC project is to provide a framework helping tourists, citizens and stakeholders to promote their personal preferences on cultural goods domain taking into account that a destination has to be seen as a combination of products, facilities and services that bring together a combination of tangible elements (as local attractions, museums) and intangible aspects (as ambience, culture, art), as well as services and facilities which are used by tourists (e.g. accommodation) but also some which are mainly designed and used by residents, as transport and restaurants.

This concept puts the end user of the ISAAC platform at the centre of the participation from a point a view of ecosystem, social software, Web 2.0:

- a user is a citizen that is himself a tourist
- a user is a tourist that can play the role of content procurer (mister X has a picture of Dam Square in 1930 and upload on the ISAAC site the digitalization of this picture, making it available for the whole community)
- a user is a stakeholder that can become a services provider (mister X want to rent a room in his house and insert an announcement)

These ideas represent the base for the so-called “P4 business”, schematized in the following picture:

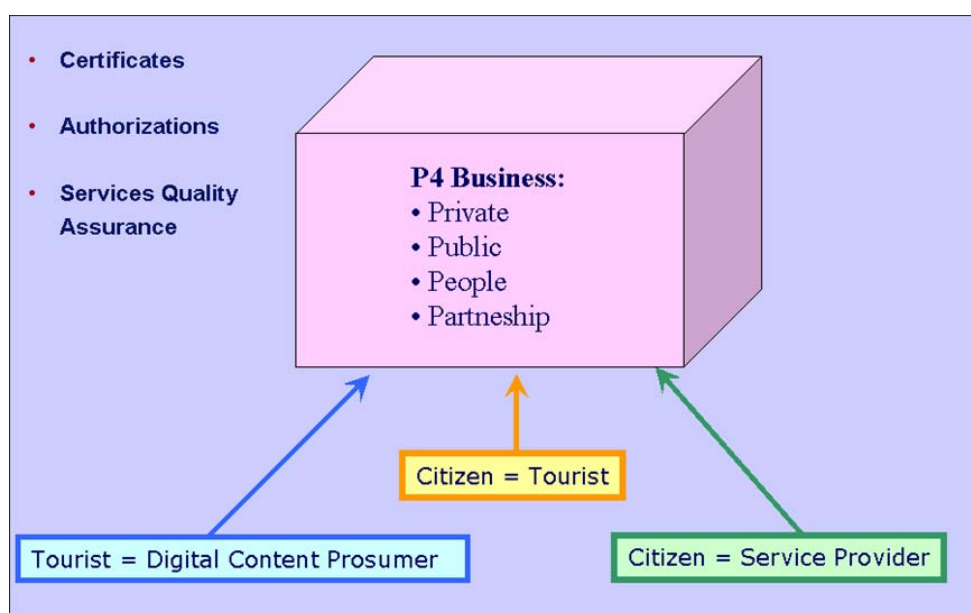


Figure 3: P4 Business Paradigm

Where the four “P” mean respectively:

- Private (restaurants, hotels, etc.)
- Public (tourism agencies, public administrations, etc.)
- People (citizens and tourists)
- Partnership (between public and private entities)

The relationships and interactions between the different actors (tourists, citizens and stakeholders) in this kind of business have to be regularised with certificates, service quality assurance and authorization systems

From these theoretical principles, we can identify three main categories of users involved in the ISAAC platform life:

- **Local residents:** are perceived both as potential tourists for other destinations as well as citizens and residents of the city. Local residents are those who can create their own cultural heritage (and publicize it on the web, for instance). Local residents can identify a list of eservices that they would like to have in order to achieve a better quality of life and access their cultural heritage.
- **Stakeholders:** are identified as people who “hold a stake”, mainly decision-makers working in areas related to cultural tourism and cultural heritage. Stakeholders can represent both private and public entities. Their interest in cultural heritage and tourism can be split to different categories according to the different areas they are belonging to:
 - Governments : stakeholders interested in getting their country into the global information society
 - Businesses : stakeholders interested in making money and create new markets and profitable activities with less risk
 - Third Sector : stakeholders interested in promoting wider participation and transformation of society
 - Organizations: stakeholders interested in being part of the process and push their agenda (e.g. their mission)

Stakeholders are especially relevant to get insights on the way the perspective platform could support their decision-making (how the destination is presented and branded, the competitiveness of their destination). They are useful in understanding what role Internet is playing in the competitiveness of the city they are governing.

- **Tourists:** are people visiting the city or just preparing their visit as well as those who are going back to the city. Tourists’ aim is to enjoy the city and their visit. Their secondary aim lies in understanding and exploring cultural heritage, tangible and intangible. For the purposes of this research, tourist are defined as people who are come from another city and whose main aim of visiting the city is tourism (non-business or work-related trip) and who spend at least one night in the city.

At the meantime, this choice is compliant with the focus groups activities performed during the Task 1.3 implemented on these same three user categories. The results of the Task 1.3 will be in fact the base for the user requirements analysis for e-services discussed in the following paragraphs.

3 Users' requirements for ISAAC e-services and architecture

Starting from the analysis of current digitalization in the European tourism domain, in particular in terms of web site evaluation and e-services specifications (Task 1.1) and from the user requirements analysis during the focus groups activities (Task 1.3), the following paragraphs aim to analyze from a more technical point of view the main features for the ISAAC platform. This analysis will be the kick-off step for the ISAAC architecture and e-services design and specification to be done during the Task 2.2 with deadline at Month 11.

This chapter can be considered a preliminary feasibility study of the ISAAC ICT platform design that will be finalised during the Task 2.2 activities. This study is focused on the following main points:

- What is the current status in the digitalization of cultural heritage content (see section 3.1)
- What are the wishes of potential users (see section 3.2)
- Which devices (protocols) are used by the potential users to receive and enjoy cultural heritage related content (see section 3.3)
- What is in technical sense feasible to produce by the ISAAC team (see sections 3.4. and 3.5)

According to the identified issues, the first paragraph of this chapter gives a resume of the Task 1.1 and Task 1.3 results about general aspects of the ISAAC ICT platform, while the point 3.2 will resume the main requirements coming from the Focus Groups performed in the three different case study cities.

The paragraph 3.3 gives an overview of the most common technologies (devices and protocols) used by potential users to receive and enjoy cultural heritage related content. This overview will guide the ISAAC team in the definition of e-services and will form the constraints of what should be developed during the project.

The point 3.4 will analyze the user requirements gathered in the paragraph 3.1 from a technical point of view trying to identify possible functionalities for the ISAAC platform and trying to understand possible multimedia capabilities limitations. Finally, the paragraph 3.5 will resume and analyze the gathered e-services requirements coming from the Task 1.3 activities in terms of resources, scalability, user-interactivity, and effectiveness of the intelligence feedback system.

3.1 General Requirements

A first preliminary phase on the user requirements analysis starts from the results of both Task 1.1 and Task 1.3 and produces some major general considerations and suggestions for the future design and development of the ISAAC ICT Architecture.

The first step of this analysis takes in consideration the result of the Task 1.1. The Task 1.1 activities have provided an in-depth review of current digitization issues, of cultural data interpretation for cultural heritage in tourist destinations, and destinations' and cultural tourism web sites in particular.

The following table resumes the main evaluation categories identified during the Task 1.1 for existing best practices in web sites in e-tourism and cultural heritage domain. The criteria were derived from different site evaluation studies, conducted on general web sites and tourism related ones in specific.

These same criteria will be used at the same time as starting point before and evaluation criteria after for the design, development and test of the ISAAC platform.

Category	Description
Functionalities / Interactivity	Interactivity is a term unifying possibilities for users to interact with a platform by means of online communication opportunities such as information request forms (questionnaires), e-mail hyperlinks, feedback forms, search engines, scripts and applets.
Design / Layout	Design of a platform is a first impact on user imagination. Tourism is an industry in which the visual component evoking emotions play a very important role.
Usability / Ease of use	According to ISO 9241-11 (1998) usability is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction".
Content	The web content and the development of the web content of a cultural web site is extremely important to increase participation on the audience (e.g. opening hours, collections, databases, infrastructure, facilities , etc.)
Heritage interpretation/representation	Heritage interpretation was translated into generic experiences, enjoyment/entertainment experiences, and learning experiences, integrating aspects as tangible/intangible. This aspect is relevant above all for the pre and post visit phase of the cultural experience.

Technology / e-services	The technology is the core of the development of novel integrated e-services that can capture the users' interest. The main issue is the identification of what kind of devices tourists, residents and stakeholders currently deploy when using e-services.
e-Governance / e-Participation	Cooperation with public, private and third sector to promote cultural tourism/heritage interpretation in the city.

According to the above-identified criteria, the work done on the Task 1.1 has identified some major values and lacks on existing cultural tourism web sites as well as characteristics on destinations portal.

The following tables resume the main conclusions gathered for the cultural tourism and destination websites analyzed.

The “value” column represents good aspects retrieved in the analyzed site, while the “lack” column identified the lacks of the selected site for features considered useful and interesting from a tourism and cultural heritage point of view.

The first table resumes values and lacks for cultural tourism web sites:

Cultural Tourism web sites	
Value	Lack
Well organized in all categories	No fun elements
Not a good personalization	Loosing track of time
Intelligent systems	No good understanding of heritage related to interesting places
Good use of pictures and interactive Maps	No learning material
Chat rooms and forum	No fun elements
Good example on in virtual tours	Restricted linguistic offers
Good example on chat rooms	Medium level of use of videos, sounds and stories
Good example on games	
Good example on 3D models	
High quality examples for combining virtual tours and 3D applications with interactive (Theban	

mapping project or Heineken Experience in Amsterdam)	
Good quality examples of provision of collections through databases and (interactive) learning material good	

The second table resumes values and lacks for destination web sites:

Destination web sites	
Value	Lack
Well performance in functionalities/interactivities	No fun elements
Good design/layout	Loosing track of time
Good usability/ease of use	No good understanding of heritage related to interesting places
Good heritage interpretation	No learning material
Good content	No good material explaining deeper meaning of the places
Good satisfaction/future use	Medium level of use of videos, sounds and stories
Good use of pictures and interactive map	Restricted linguistic offers
Good use of forums/blogs	Medium/Low performance in virtual tours
Good use of interactive maps	Medium/Low performance on chat rooms
Good use of travel planners	Medium/Low performance on games
	Low performance on 3D models
Good use of online shops	Lack of co-operation (links) between the tourism web sites to the cities web sites (only in Italy tourism is mainly integrated into the cities main web site)
	Low consultation regarding tourism experience and enabling cultural transactions.
	Medium level as the use of a multi-sectoral

	design of the web sites, and the richness of stakeholders
	Medium use of pod cast files for online and offline tours

In general both, destination and cultural tourism web sites, show that it is possible to provide a unique virtual experience on their web sites when technology and interpretative media are used in on a sophisticated level, but also when they provide fun and learning experiences.

Next section of this report will analyze in detail the user requirements for ISAAC e-services and ICT Architecture gathered in the three case study cities.

3.2 Case studies perspective

The above analysis derives from the Task 1.1 activities, while the following paragraphs aim to analyze the requirements gathered during the Focus Groups activities (Task 1.3) in the three case studies cities involved in the project: Amsterdam, Genoa and Leipzig.

3.2.1 Amsterdam Perspective

A common denominator of the three focus groups in Amsterdam was the need for one central integrated web site that could satisfy all information needs about cultural heritage and in addition provide possibilities for booking a ticket, printing a route planner, having a personal agenda, time planners, blogs and forums

Main requirements for the ISAAC integrated platform according to the people interviewed suggestions are summarised in the following table:

User Requirement	Description
Profiling	The platform should provide personalized information in the form of a 'tourist profile', personalized travel plan, or sub-sites dedicated to specific types of tourists or residents (e.g. children, backpackers, seniors, etc.)
Interactive Maps	Importance of presenting information on interactive maps. Especially for practical information, this would be the perfect medium to navigate in a

User Requirement	Description
	virtual manner through the city. The maps should be interactive so people can click on points of interest and get more detailed information in any form (text, photographs, audio, movies, or booking forms)
Direct Access to booking and discount	Most users need to have a direct access to online booking system and the identification of possible discounts.
Dynamic journey planner	Updating travel information during the city visit is very important. These updates could be provided on mobile systems or so-called internet kiosks. Tourists active in both focus group meetings expressed their wish for during-visit information and possibilities to update information and itineraries
Post-visit feedback	Need to experience the city better and to give feedback about visits and experiences with help of technological instruments like forums or blogs
Experience life-cycle	Distinction between pre, during and post visit information applies especially for cultural destinations like museums, etc. When navigating the city map on the portal some general information could be given to the tourist about a certain museum and its collection. While visiting the museum visit information could be given in the form of audio or video pod casts. This information should, for example, be provided by means of computers installed in the museum. The participants also showed a need for post visit information about a museum and its collection (e.g. in-depth information about a painting and the artist). Furthermore, practical information with regard to public transportation and updated itineraries should be delivered timely and preferably on mobile devices
Up to date information and quality content	Various valuable data sources and information are present at various public institutions. The main problem is how access this information and transform it into valuable and suitable e-services. The integration of this data sources is technological sense possible but difficult due to political burdens. Building trust among the various institutions is seen by the participants as essential for the development of new services and cooperation
Reliability of information	Both residents and tourists would like the local authority (municipality) to take over the role to deliver the appropriate, up-to-date information per

User Requirement	Description
	each e-service. Consumers' generated content is also high in the agenda. People would like to contribute to the offer, and some suggest even a city wikipedia
English Language	The use of English is also very important for tourist-oriented e-services
Mobile technologies	Mobile devices like a GPS or PDA system that could provide descriptive background information on architecture, squares, buildings and paintings. Many participants mentioned they would prefer features as audio tours, video/audio, pictures and text that are linked to a large historical archive and other databases
Newsletter	Trailers of upcoming cultural events could be added and could be interesting for tourists. The information that is in the travel community, and that is also validated by them, could be featured on related sites

3.2.2 Genoa perspective

The discussion in all focus groups in Genoa mainly focuses on the Internet and Internet websites, as well as its possible modifications.

The main concern coming from the three different phases is the idea to have an integrated website that would offer links to all sources of tourism-related and practical information on the city as well as a multitude of applications related to tourism (guides, maps, itineraries as well as tickets and seats booking and payments) and cultural heritage in general.

Principal suggestions concerning the requirements for the ISAAC ICT platform are resumed in the following table:

User Requirement	Description
Personalize web sites	Internet websites that adjust to users' needs and profile by offering the user the selected information only; to this might prevent the "information overload"
Internet communities	Sharing information with the others on-line in the form of both providing "insider's hints and suggestions" to potential visitors as well as getting some feedback from the city's stakeholders and tourism promotion

User Requirement	Description
	authorities (answering the citizens' and tourists inquiries)
Journey Planner	A digital application allowing planning a visit to the tourism cultural destination of your choice, including your own city. It can include maps, highlights, and guided tours. It is combined with GPS navigation and provides thematic tours. It can give hints about the time it will take and best transports/routes.
Interactive Panels and Maps	special maps which offer tours of the city according to the users' demands; they omit the irrelevant information and provide a guide of the city's selected sites
Virtual tours	On-line interactive tours including videos, image-sharing and interactive presentation of the city
e-participation system	Share information with others, receive updates and hints from the other users as well as to be able to engage in cultural and public life.
e-governance system	An Internet-base application that simplifies the interaction between citizens and local authorities (this is a resident specific e-service). It provides access to virtual Municipal offices and local political information database. In addition, it gives the possibility of voting in elections through the Internet as well as entering the opinion polls on-line.
Totems	Panels on site for tourist and residents that could offer information and help in the choice of itineraries
Newsletter	Trailers of upcoming cultural events could be added and could be interesting for tourists. The information that is in the travel community, and that is also validated by them, could be featured on related sites
Multilanguage system	The supply of information in other languages has identified as an important point. Participants point that not many sites intended to attract foreign tourist to Italian cities can offer a good presentation in languages, other than Italian

3.2.3 Leipzig Perspective

The focus group discussions in Leipzig showed that for all three groups of users (residents, tourists and stakeholders) an internet presentation with integrated e-services is the most important media to convey information on cultural heritage. The main need identified is an Internet website where all tourism related information would be organized and integrated. This information might include itineraries, suggested tours, guides, transport and on-site information (DOs and DON'Ts), booking of tickets, seats and events, calendar of events, maps and navigation.

All groups stressed the need for an integrated information offer, which consists not only of electronic elements but as well of traditional media. Since people in Leipzig do not use very advanced mobile devices and still tended to use conventional media, participants believed that the Internet is closely related to conventional media like TV, radio, newspapers and any other printed media. Therefore, they would like to find some possibilities to combine e-services and other “traditional” services

Another important advice to take in consideration during the design of the future web portal is that both the residents and the German attendees of the tourists group pointed out that too much information could reduce the joy of travelling. The argumentation in both groups was like “the more you know, the less you have to discover”.

The following table resumes the main characteristics for the ISAAC Integrated platform gathered during the three phases of the Focus Groups in Leipzig:

User Requirement	Description
Personalize web sites	An Internet website that would store the user's profile and offer specially-tailored calendar of events, suggestions for tours and itineraries, etc.
Multilanguage system	The supply of information in other languages has identified as an important point. Especially the foreign attendees felt uninformed, as there is only little information in English and even less in other languages. The residents, in contrary, thought the information offer was sufficient, so did the stakeholders. All groups had ideas on how to improve the level of information
Up-to-date internet website	In all other focus groups, the participants expressed their interest in an up-to-date internet website with integrated services. These could be online information (stakeholder) about events and

User Requirement	Description
	tourists highlights or online booking services and e-governance (residents).
Online TV programs, calendars and magazines	Online information related to the city's tourism available for download, like for example Downloadable audio and video guides (podcasts) for certain themes
Virtual maps	Interactive maps that enable choosing the personalized tour of the city and obtaining links to the places and landmarks depicted on the map
Profiling	The portal should provide personalized information in the form of a 'tourist profile', personalized travel plan, or sub-sites dedicated to specific types of tourists or residents (e.g. children, backpackers, seniors, etc.)
e-participation system	Share information with others; receive updates and hints from the other users as well as to be able to engage in cultural and public life.
e-governance system	An Internet-base application that simplifies the interaction between citizens and local authorities (this is a resident specific e-service). It provides access to virtual Municipal offices and local political information database. In addition, it gives the possibility of voting in elections through the Internet as well as entering the opinion polls on-line.

3.2.4 Cities Common Perspective

The following paragraph tries to collect requirements that are common to the three different cities by comparing the results obtained.

Major general considerations arising from this process are the following:

- Amsterdam in general makes good use of digital media, using a variety of different interpretation media intensively in the different locations visited. The web sites show a similar picture. The web site of the City of Amsterdam can be called sophisticated in terms of e-services for residents, and it has a well-developed GIS system. However, representative of Amsterdam attractions, when interviewed, viewed their web sites critically and told us that major changes are in progress. For Genoa and Leipzig the use of digital media in the museums is less widespread, yet more use is planned and already in progress for the future. Genoa's web site is not offering such a linguistic variety as the other two cities, in particular Amsterdam. Genoa has developed successful initiatives to encourage residents to visit its museums. The approach of bundling a number of museums into one portal, as found in Genoa, seems promising from the user point of view, and similar examples were found within the good practice examples as Los Angeles.
- Residents' tourism involvement is pushed forward by Amsterdam and Leipzig by informing them about tourism activities through various media to both involve and reassure, as well as to reaffirm support for their tourism policies.
- The web sites evaluated are mainly designed for tourists. However, through interactive communication user forums or blogs, residents can be well integrated and online communities are formed. Cultural blogs in particular provide valuable and useful content to make these tools successful, enabling communication on different levels and between varieties of stake- and need-holders.
- Travel planners (variable by technology adoption level) and fun tools not only support the understanding of the destination's heritage, they also enable triggering of emotions through the provision of stories and pictures. The use of sounds and animation further improves this. These emotions, unique symbolic places and heritage, and stories facilitate a virtual experience and are in this case unique experiential and symbolic selling points, which distinguish places from competitors and "similar places". Blogs can support this process as they also offer the possibility to tell, read and discuss personal emotional experiences and stories. The examples described within the developed good practice framework demonstrate that addressing emotions through stories, fun and interactivity not only creates unique

experiences, but also enable destinations to integrate and engage users' on a long-term basis as users of their web sites through interesting culturally-themed communication tools such as blogs or user forums. The city status report provides an overview and reflection of the digitization status of the three partner cities Amsterdam, Genoa and Leipzig through interviews conducted and observations, as well as further web site evaluations.

- Differences between destination and cultural tourism web sites with regard to adoption of technology, general performance and the use of interpretative media were identified. Although both showed high performance levels for all categories, the cultural tourism web sites performance level was higher.
- Common points for improvement were identified for both kinds of web sites, suggesting the greater use of interpretative media such as videos, virtual tours, sounds, stories, chat rooms, 3D models and games. In particular, such fun elements are missing, and few designers and organizations facilitate such a feeling of engagement that users lose track of time on their sites.
- Cultural tourism web sites additionally offer online exhibitions and collections, 3D applications and interactive learning resources. Interactive maps are focused on exhibition areas. Although good examples were identified, they are generally under-represented. Cultural tourism web sites are also lacking in their linguistic offer.
- Examples of separate access for mobile users, interface versions for the visually impaired and the prominent display of information concerning disabled access are rare. Similarly rare is the promotion of WIFI points for immediate access within the city.
- In terms of the tourism eServices provided by destination web sites, we identified user forums/blogs, interactive maps, travel planners, virtual tours, podcast files for online and offline tours, games and fun tools and online shops. Different technology adoption levels have been found here as well. The strong points of these web sites proved to be the provision of pictures and interactive maps. There is further variety in potential in particular in travel planning and tours, combined with interactive maps and fun tools.
- The evaluation of the destination web sites identified substantial weaknesses in all eGovernance aspects and a lack of co-operation (links) between tourism web sites and main city web sites, apart from in Italy where tourism web sites are largely integrated into main city web sites. The substantial shortcomings in all aspects ensure that little deliberate involvement occurs, and that both government-led and citizen-led active participation is non-existent. In addition, levels for consultation regarding tourism experience and enabling cultural transactions are low. However, some aspects perform on a medium level, and these include

the use of a multi-sectoral design of the web sites and the number, diversity and richness of stakeholders. Nevertheless, in general both destination and cultural tourism web sites show that it is possible to provide a unique virtual experience on their web sites when technology and interpretative media are used in on a sophisticated level, but also when they provide fun and learning experiences. Destination web sites could improve their offer in learning and enjoyment experiences as demonstrated by some examples presented on cultural tourism web sites. The good practice examples provide a deeper understanding. The technology adoption level is high on the selected web sites (Dublin, Los Angeles, Liverpool, Zurich and Rome) and offers inspiration and underlines potential enhancements for destination web sites.

3.3 Technologies¹

Europe is one the main leaders in providing high-tech, reliable communication and embedded software technologies. Many of the telecommunication companies are embracing the new generation of mobile software and hardware, and are set to lead the market with the production of these.

On this basis, ISAAC opportunities to innovate are targeted towards:

- The creation a framework which extends interface components from common PC-based applications to homogeneous machine-independent platforms, for each level of the interface; software- (e.g. Web-browser), operating system- and machine-level.
- Apply state-of-the-art techniques used in mobile agent technology to allow necessary intelligence feedback for individual users or organizations to be independent of location.

ISAAC will use the potentials of mobile technologies for enhancing the links between local heritage and tourism, since smart mobile vices can accompany the tourist all along her/his tour path, providing the right information at the right moment. For ISAAC, mobile devices will host innovative creative applications (e.g. games involving tourist, who have to discover the richness of the territory, and local citizens, who may act as wizards/advisors, etc.). ISAAC will target to go one-step beyond the recent advances in mobile computing and communication technologies, which are leading to a widespread diffusion of network-enabled multimedia devices able to accompany everybody anywhere and at any moment. A wide range of portable devices will be targeted by ISAAC (e.g. normal cellular phones, smart phones, Palmtop Computers, Tablet PCs, etc.).

¹ See “State of the Art Report” pp. 66-79

In fact, except for common web site portals, new mobile access technologies are a powerful tool for making information resources available during visits to cultural institutions. These applications currently come in two primary types: the first is influenced by positioning ability, indoor or outdoor; the second supports the process of obtaining information on specific items at specific times, which can be considered a natural progression from standard, conventional audio guides. Technologies likely to have a strong influence on future institutional strategies include increasingly powerful, portable and affordable devices such as PDAs and cellular phones, and new wireless communication protocols such as Bluetooth, WAP (Wireless Application Protocol) and GPRS (General Packet Radio Service).

In contrast to the use of audio guides or other specialized devices, which typically required to be maintained by the cultural heritage institutions and were borrowed by the visitors, new mobile devices are often owned by the visitors themselves. This may bring a radical change in the way heritage institutions think about formulating and financing their technology strategies. What is becoming increasingly necessary is the ability to provide wireless connection to the right information and to suitable content, with guaranteed compatibility across platforms and protocols. Visitors therefore benefit from guides that can offer an unprecedented level of personalization and self-direction. They now have the opportunity to follow the most suitable learning content that matches their interests most closely, and to combine information on the collection with Web content in a convenient and intuitive manner.

Handheld devices, such as personal digital assistants (PDAs) and cellular phones, are currently among the most popular and affordable consumer technologies. Experiments with their use in the cultural heritage sector indicate that they have the potential to transform how we visit and experience heritage institutions. Handheld devices are flexible, have increasing amounts of storage, and provide multimedia support for audio and video content. The miring of functionalities (e.g. mobile phones with cameras, audio players, and organisers) has led to a radical change in the ways in which mobile devices are and can be used.

A number of organizations in the cultural heritage sector already utilize the communication potential of mobile access technologies. This work may be viewed as a natural further extension or development of the work carried out with audio guides, particularly when these are used in conjunction with positioning devices.

According to the above considerations and to the ISAAC innovation priorities², the ISAAC ICT platform will be an integration of different technologies. In fact, ISAAC will target to go one-step beyond the recent advances in mobile computing and communication technologies, which are leading

² See Annex I – “Description of Work”, pp. 14-15

to a widespread diffusion of network-enabled multimedia devices able to accompany everybody anywhere and at any moment.

3.4 Analysis of user requirements for ICT architecture

This section aims to analyze the user requirements identified in the previous section 3.2 from a point of view of the multimedia capabilities of the current prototype in terms of resources, scalability, user-interactivity, and effectiveness of the intelligence feedback system.

3.4.1 Methodology

Starting from the information gathered in Task 1.1 and Task 1.3 and combining them with the requirements of the project derived from the Description of Work, the following paragraph aims to figure out first ideas about the ISAAC ICT architecture that will be the base for the future design and development of the ISAAC integrated platform to be done during the Task 2.2 and Task 2.3 of the Work Package 2.

From the Description of Work of the project, ISAAC considers the following critical factors to build its innovation:

- Human-Computer interaction modalities.
- Diffusion of portfolios of useful and compelling applications.
- General success of applications and services for cellular phones
- Interoperability at all levels.
- Lack of natural interactivity
- Availability of contents at reasonable costs.

One of the main innovation streams that ISAAC aims to address is to concentrate on technical limitations that affect the real usage of e-services, limiting the real exploitation of multimedia content on mobile devices. ISAAC will use the potentials of mobile technologies for enhancing the links between local heritage and tourism. Therefore, on this first point ISAAC will seek innovation at “application” level, including improved user interaction, content availability and management, business models. A wide range of portable devices will be targeted by ISAAC (e.g. normal cellular phones, smart phones, Palmtop Computers, Tablet PCs, etc.).

Starting from the above project objectives and from the evaluation parameters applied during the analysis of the existing cultural tourism and destination web sites in Task 1.1, the following table provides a list of criteria that will be used as guidelines for the design of the ISAAC system before and for the future evaluation of the platform on the cultural heritage domain after:

Functionalities / Interactivity	
1	This platform has all the functions and capabilities that I expect it to have
2	The information retrieved by the platform was effective in helping me to complete the tasks
3	This platform conveys the feeling of being interactive
Design / Layout	
4	The interface of the platform is likeable
5	The organization of information presented by the platform was clear
6	The interface of this platform was pleasant to use
7	This platform supports the content with appealing pictures
Usability / Easily accessible before during and after visiting the cultural heritage destination	
8	It was simple to use this platform
9	Information needed is easy to find
10	The information (such as online-help, onscreen messages, and other documentation) provided with this platform was clear
11	Overall, this platform was easy to use and navigate
12	No information was needed to read before I can use the platform
13	Interaction with the platform was clear and understandable
14	It is easy and quick to recover from mistakes made

15	The platform gives error messages that clearly told me how to fix problems
16	The platform services are financially affordable
Heritage Interpretation	
Enjoyment / Entertainment Experiences	
17	The visit of the platform offered variety
18	The platform can inspire users
19	The platform enables curiosity
20	The platform has elements which are provoking interest
21	The platform has fun elements
22	Track of time is lost easily while using the platform
Generic Experience	
23	The platform established quickly a familiar feeling
24	The platform helped to understand heritage related to the place better
Learning	
25	A link was established between historical facts and realities today
26	The messages were clear and easy to remember linking them to the place
27	The platform visit was informative
28	The platform provided learning material related to the place
29	The platform provides material deeper and hidden meanings related to the place on the platform
30	The platform used stories and themes to convey a message related to the place
31	The audience's participation is sought by getting to use their senses
Use of Interpretative Media	

32	The platform encouraged participation through the use of different media
33	Videos were provided at the platform
34	Pictures were provided at the platform
35	Virtual tours were provided at the platform
36	Sounds were provided at the platform
37	Maps were provided at the platform
38	Stories were provided at the platform
39	Chat rooms were provided at the platform
40	Games were provided at the platform
41	3D models were provided at the platform
Content	
42	Are the basic information needs covered by the platform?
43	The platform is available in multiple languages
44	The platform is designed for tourists
45	The platform is designed for residents
46	Overall, I find this platform useful
Technology / eServices	
47	The platform offered personalization
48	A recommendation system is included in the platform
49	There is evidence of intelligent systems used by the platform
50	<p>The platform makes use of a combination of different technologies. If yes, identified what devices can be used to enter the e-service:</p> <ul style="list-style-type: none"> • Computer • PDAs

	<ul style="list-style-type: none"> • Mobile phones • iPod • Other:
Satisfaction	
51	I felt comfortable using this platform
52	Overall, I am satisfied with this platform
53	This platform meets my expectations
54	Overall, I made some positive experiences with the use of the platform
Future Use / Commitment	
55	From my current experience with using the platform, I think I would use it regularly
56	I could recommend this platform
E-services special collection:	
57	Name eService 1
58	Name eService 2
59
E-governance / E-participation	
60	The platform offers a public access point strategy
61	The platform interface shows a multi-sectoral design approach
62	The platform is rich in terms of stakeholders (public, private and Third Sector with common interests in empowering the cultural tourism sector)
63	The platform enables cultural tourism transactions
64	Consultations about cultural tourist experiences are present on the platform

65	The platform includes deliberative involvement
----	--

The following analysis of the ISAAC ICT architecture has tried to figure out different requirements for the ISAAC platform following the guidelines contained in the above table.

These same criteria will be applied for the evaluation of the first ISAAC prototype on Task 2.3 and for the final ISAAC prototype testing on Task 2.4

3.4.2 ISAAC ICT Architecture ³

According to the ISAAC work plan and to the user requirements gathered in the three cities Amsterdam, Leipzig and Genoa, the main requirement for the ISAAC project is to create a novel ICT system consisting of an intelligent mapping of European cities cultural heritage, including tourists' satisfaction and response, and policy makers decision support systems. This will be realised in particular by developing:

- Customized e-services for retrieving and accessing complex multimedia information represented by the identified reference model
- An e-governance framework for assessing the implications of strengthening ICT in promoting local heritage for enhancing the attractiveness and competitiveness of cultural tourist destinations. This instrument will enable the use of information and communication technologies in public administrations combined with organizational changes and new skills to improve public services, reinforce democratic processes and support public policies to foster interaction between citizens and decision-makers through e-participation channels (online forums, virtual discussion rooms, polls, referendums, etc.) in cultural tourism management and destination promotion.
- A decision support system based on a multi-criteria evaluation technique and a set of indicators that will provide cultural tourism and heritage organizations with information about
 - Conditions to be met by organizations in order to offer ISAAC e-services
 - Changes in the way tourism is consumed due to the introduction of the e-services in destination development (urban impacts)

³ See ISAAC main products, Description of Work, pp. 6-7. See also ISAAC innovation key IT claims, Description of Work, pp. 13-15

From a platform perspective, these objectives can be reached with the integration inside the ISAAC platform of:

- Intelligent content
- Intelligent agents
- Information advanced presentation features
- New e-services and new e-services integration

First three requirements concern the content management features that the ISAAC platform has to handle, according to the reference model upon which the knowledge base of the system is built and according to the user requirements in terms of customization, visualization and management of the stored information. Note that the storage of the content not only calls for a taxonomic definition (related to content), but also asks for technical data standards. The requirements in term of content management and classification of cultural goods will be gathered from the results of the Task 1.5 “Defining an EU indexing system to standardize retrieval in the CH domain”. In fact this task aims to define a glossary following taxonomy of Cultural goods from a consumer perspective that will be at the base of the knowledge base management at the core of the ISAAC platform.

3.4.2.1 The ISAAC framework

According to these requirements, a first abstract framework of the ISAAC platform can be schematically resumed in the following picture:

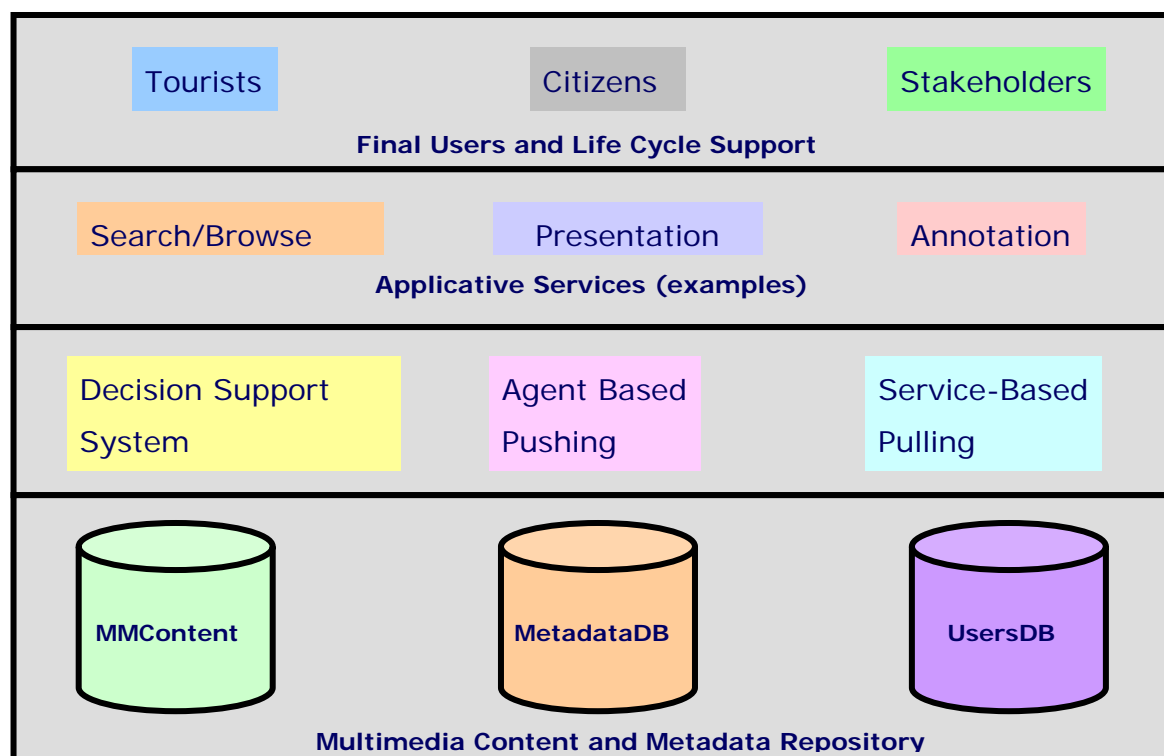


Figure 4: The ISAAC Abstract Framework

From the bottom side, the first one is the layer of the intelligent content, where not just Multimedia content repositories, but also meta-data and user profiling databases will be developed.

A multisided strategy with user-targeted content and look and feel, based on a central repository would be better. The EU could contribute in creating a single taxonomy. In addition, a standard on writing addresses. The city archives could deliver content for specific target groups. They could supply content for virtual tours, thematic events (e.g. Rembrandt year), and show highlights of specific cultural offerings. The group would like to see better usage of Google maps, to have full tourist information on one interactive map.

The architecture will provide mobile services in collaboration with the archives. More use should be made of SMS text messages on mobile devices. GPS linked information on architecture would be a great desire. For Virtual tours partnerships could be made with the biggest travel blogs, they could feed their content into other sites.

The MetadataDB is the repository containing all metadata linked to platform contents. This metadata will be used by the Information Retrieval and Content Management services in different environments like web, library catalogues, documents and records management, GIS. This repository structure and contents is strictly connected to the GIS database structure and content.

The UsersDB contains information about users registered on the ISAAC platform. This information will be used for authentication purposes, as well as for profiling contents according to user's type and individual preferences.

The second layer will be a hybrid middleware developed by integrating basic information push-pull functions, respectively realized via an Agent-based and Service oriented architecture, with multi-criteria decision support features for policy makers.

ISAAC Intelligent agents will help users of the ISAAC platform to compare and customize information. This will be even more relevant when assessing tourists' satisfaction of the provided services on site and off site, and providing support to decision makers in the sustainable management of cultural heritage.

As said before, ISAAC decision-support system (DSS) will be based on a multi-criteria evaluation technique and a set of indicators that will provide cultural tourism and heritage organizations with information about:

- Conditions to be met by organizations in order to offer ISAAC e-services;
- Changes in the way tourism is consumed due to the introduction of the e-services in destination development (urban impacts).

A third layer will be that of specific applications called e-services.

Examples of services:

- Show movie
- Show location on map (GIS)
- Add monument descriptions
- Search monument based on description
- Search monument based on location (GIS)

Services should be able to be inserted in city websites as single components as wished upon by the cities. Services should be developed in such a way that they are available on handheld devices.

Examples:

The city of Amsterdam might only want to use the services “Add and edit monument description” in order to update the monument database and the service “Show monument on map”, in its website.

An other city might only be interested in providing tourists with PDA's where tourist can see their location, ask for directions to addresses and have descriptions of buildings.

For tourists in Amsterdam, the main objective of the website would be to make it easier to find interesting cultural things to do, to give an impression of the city and to make it easier to find venues.

3.4.2.2 *GIS Requirements*

An important requirement for the ISAAC platform is to have the possibility to access GIS information in order to realize more advanced services like, for example, virtual maps, interactive maps, and system for searching point of interests and so on. The GIS system is therefore one of the most important module composing the ISAAC ICT architecture.

In order to understand the GIS requirements first, we need to realize that a spatial data infrastructure implies an infrastructure, which is itself made from a large number of services -- classed into three essential groups: indexing and searching services, data retrieval services, and data transformation services. This taken together, a spatial data infrastructure is there to ensure that data can be found, accessed and delivered in useable form.

It is by design flexible and, for lack of a better word, 'uncaring' about what exactly passes through it - it sets standards and protocols for *how* to form a request for spatial data, and who is allowed to access its various component services, but does not impose other rules on use. It contains no 'logic rules' to check if a request is actually for anything that could be considered a useful service, or for some completely incoherent pieces of data.

A spatial e-service then, which uses spatial data, must be seen then as an application that makes use of these infrastructure level services, and adds a consumer-level interface and some pre-structured routines which contain the logic and information on which information is to be combined in order for this service to provide value to its user.

The whole question of what a spatial e-service can do is defined at this level; Two different e-service examples - their differences matter not for the SDI.

- 1) An e-service that can read out a GPS to get the user's location, and then send a query to the infrastructure to ask which is the nearest item from the cultural heritage database, and to return

the answer displayed on a map at a size that fits a PDA screen. This makes a nice starting point for a 'guided tour' through a city that a user can play from a device in hand.

2) An e-service that can make a query on which known objects in a given city are hotels, retrieve their attributes, and use internal logic to render the attribute list as a human-readable hotel list with contact information. This could be one of the services included in an information kiosk.

The question of whether an interactive map of a particular type can be made then, given that all the necessary data for it is available, is strictly a matter of what logic is contained in the e-service itself, and the limitations of the platform on which it is implemented.

3.4.2.3 *Requirements for ISAAC e-services*

From a pure end user point of view, the first requirements gathered from all kind of users during the Focus Group⁴s is the need for one central integrated portal that could satisfy all information needs about cultural heritage and in addition provide possibilities for booking a ticket, printing a route planner, having a personal agenda, time planners, blogs and forums. This web portal will be the core of the ISAAC integrated platform. Here the ISAAC user can enter and plan the different phase of his/her cultural experience: pre-visit, visit and post-visit.

An example of usage scenario of the ISAAC platform should be the following:

- When people are entering one could choose to fill in a profile consisting of demographics and cultural interests. Then one enters the site where information is presented by categories. The main categories would be: necessities, arts, entertainment, history etc. Each of the main categories would lead to subcategories; e.g. necessities - (hotels, food, travel, hospital). In each subcategory the events and/or venues would be shown on a map with icons. One could click on each icon to get more detailed information on the event/venue with practical information like opening hours, prices etc, but also impressions with pictures and movie clips.
- When one chooses the event or venue of choice the possibility is given to directly book or make reservations. There should also be a possibility of accessing daily or weekly events' agendas, therefore, visitors can have a printable version of coming activities in the city, then make a better plan for their trips. A system of drag and drop was suggested for this. It has

⁴ See D1.3 "Developing alternative platform scenarios", chapter 6.1 "Users' preferences for e-services"

been emphasised in the group that it is crucial that the information on the website is up-to-date and reliable.

In such a scenario, an example of set of user requirements for this kind of platform could be:

- Adaptable style to the profile of the visitor (specified on entry)
- Everything is indicated on an interactive map
- A search engine
- Venues organized by category
- Ability to compare venues
- Online help
- Levels from general information and categorization to specific
- Booking directly from site
- Categorized by phase; before, during, after
- Direct access to venue e.g. link
- It has to be attractive (i.e. pictures of venues)
- Ability to post pictures and films
- Webcams of attractions

In addition, an example of set of themes addressed by the e-services could be:

- Clubs
- Museums
- Churches
- Restaurants with menus and prices
- Excursions
- Extreme sports
- Veterinarians / doctors
- Arts
- Music
- Shops

- Weather
- Local habits

This user-centric approach will be at the base of the ISAAC platform design and development. This approach on the other side will require a customization of the e-services provided according to the users needs. This customization will be done on the content side with a different organization of information according to the user preferences, as well on the technological side with the possibility to enter the platform in different way. In fact, one important requirement for the ISAAC architecture (identified in the Description of Work of the project) is to allow users to enter the provided services by using different instruments. According to the users needs and to the technological feasibility of the requirement, some of the implemented services will be accessible via web or mobile technologies (PDAs, mobile phones, iPod). From a technical point of view, in order to support different technologies the ISAAC integrated platform will be designed and developed taking a deep attention at design time to the use of common protocols and standards.

Starting from these preliminary considerations, the final specification of component for the e-services to be developed will be performed during the Task 2.2 activities, after the conjoint analysis has been conducted.

3.5 Analysis of the users' requirements for e-services

3.5.1 Methodology

Starting from the e-services gathered during the Task 1.3 activities, we have identified a core of services according to the following criteria:

- Service common to Amsterdam, Genoa and Leipzig
- Service addressing the ISAAC innovation streams
- Usability of the service
- Affordability of the service
- Accessibility of the service
- Feasibility of the service

Once identified this core of services, we have analyzed the dependencies between these services, we have assigned to each service a priority and, according to effort required for the implementation and resources available in the project we identified what services we will develop during the ISAAC project life.

3.5.2 ISAAC e-services

Generally, people imagine correctly, what e-services are, though sometimes they encounter difficulties in mentioning examples of e-services in relation to cultural tourism.

There is a difference in the perception and understanding of e-services in the cultural tourism sector among the three cities, due to the different level of ICT proficiency in the three countries and probably their level of maturity as tourist destinations. Amsterdam results more advanced in the use of both mobile and internet based services, with Leipzig and Genoa well behind. People in these two cities, in particular residents and tourists, seem to lag behind in the use of e-services. On average, the proposed eservices correspond to past or currently available ones, and except a few cases, respondents find hard to come with innovative perspectives.

For some participants of the focus groups in Leipzig and Genoa “e-services” meant TV and radio, as well as traditional “paper” tour guides. People in the two cities seemed attached to services that are more traditional and consider the face-to-face interaction very important. Some of them seem concerned that advancements in e-services might imply a loss of personal communication among residents and tourists and make miss the adventurous part of travelling, transforming it into a too efficient and planned activity.

The mentioned e-services are often related to Internet, since people especially in the first phase of focus groups mention internet websites, and there are great similarities between residents and tourists’ opinions. However, people were also very interested in mobile devices. These findings are interesting and suggest that similar questionnaires should be developed for residents and tourists.

Stakeholders also mentioned mainly Internet-based services, but there are a few eservices recommended by the stakeholders, which have not been considered by residents and tourists. In general, stakeholders understand the potential of ICT in the cultural tourism sector and are better informed than tourists and residents, showing a clear supply-demand gap. However, in Leipzig, especially in the first and second phase of focus groups, they stress the importance of face to face communication. During the focus groups meetings stakeholders have replied as e-services suppliers and when asked about the e-service that could help their decision-making in the cultural sector, they have in general seen no much scope for it.

In the three cities, especially Leipzig and Genoa, tourists seem in need of practical information. They also would like to be aware of less known events and have the possibility to interact more with residents. Language is often an issues, since some information are only delivered in the local language.

Residents would like to know more about the history of their city and have virtual tours with historic reconstruction. They would also like to contribute to them with their own personal stories. They would like to interact more with tourists, and some even suggest the possibility to become special guides for alternative itineraries. They would like e-services, which might help them participate better to the city government, and they even manage to define them as e-governance systems. These e-services would also help to simplify the level of bureaucracy.

With regards to prices for e-services, focus groups results suggest different mode of payment: per download, weekly or yearly subscription with unlimited number of accesses. These alterative payment vehicles will need to be tested during one-on-one interviews, considering also the implications in terms of the econometric model to be developed. However, we suggest some possible payment mode in the proposed scenarios. One has to note that the prices suggested by respondents are quite low when payment per download is considered, and this could cause not sufficient variance in the model. On the other side, we also have to consider a credible range of possible prices. In defining this range we have

considered the prices stated in the three cities for providing their e-service. Further pre-tests will be needed to assess the final lists of attributes and the most acceptable payment vehicle.

This focus group discussion shows one crucial, but probably not surprising, point which should be taken into account. There are people who prefer cultural heritage information in its traditional formats and would not consider using new e-services. For those who would use it but are reluctant the e-services should be easy to use, in different languages, advertisement free and come from a reliable source. This source could be the municipality. Most of the people from this focus group agreed that there is enough cultural information around and the main objective should be to streamline this information and make it readily available.

Concerning the concept of cultural heritage this group has made it clear that the concept reaches beyond the “traditional” subjects like museums, art, history and entertainment, but is also comprised of habits, culture and folk stories. All agreed that this should get more attention than it gets now.

Finally, it has also been emphasized that some groups should get special attention in every service that is developed. The groups mentioned are children, disabled people, the elderly and people living on a tight budget.

The following table resumes all the e-services identified by the Task 1.3 activities.

e-service	description
Interactive Maps	An interactive map that allows the visitors and residents alike to plan their way in the city, choose the shortest way to the local highlights or provide a suggested itinerary for the visit. In a combination with a GPS system (satellite navigation) the interactive map becomes even more useful, as far as it allows the user to locate her position within the city and plan her movement from point A to point B using the optimal route. Interactive map is more user-friendly than usual maps and can be used for exploring the city on the thematic basis. Interactive maps are very useful during the visit, so the majority of them should be offered on mobile phones or portable media devices (PDA) as well as satellite navigation devices.
Thematic Search	An Internet-based search where users can look for specific tourism-related information that is of a special interest only for them. Thematic search includes creating a suggested itinerary that would usually be following one topic (i.e. Renaissance buildings or art museums).
Profiling	Feature of the Internet website allowing users to create their own

	<p>profiles in accessing information (either tourism-related or practical information on the city). This is mainly done due to the possibility of information overload. Using profiling, users can select their areas of interest and create accounts, so that when they enter the website for the second time, their profile is stored in the computer's memory and the information is delivered to them according to their specific interests.</p>
One-stop Shop	<p>Another important feature is to guarantee "one-stop shop" services. Of course, this is applicable to some specific e-services, especially booking services. However, many participants would see a high level of integration; with some suggesting a total integration of information within it, including virtual tours, and thematic search. The need for a one-stop shop confirms the results from another study conducted in the IntelCities EU funded Project where FEEM was involved to value different e-services related to job search mechanisms.</p> <p>The one-stop shop service can be viewed as an integrated Internet website that includes bookings (tickets, hotels, restaurants, venues, event), practical information on all city services for tourists (e.g. timetables, first aids, useful numbers, insiders' hints, dangers and annoyances, opening times, access to all other e-services), events calendar and interactive maps and plans of the city. This service includes all important information and can also redirect the potential users to other relevant Internet websites. It has a memory of previous visit and suggests events/highlights according to previous behaviour.</p>
Journey Planner	<p>An interactive application that allows planning one's trip. It not only passively provides information requested by the users, but also allows modifying this information and creating personalized travel itineraries. This journey planner includes video tours, virtual tours, time-planner by mode of transport, alert on highlights as well as an interactive map. Sometimes, in its most advanced applications the journey planner also includes satellite navigation (such as GPS).</p>
Event Calendar	<p>An Internet application that allows seeing the city's highlights and upcoming events by date or topic. It is an extensive database of events in the city that not only delivers information but also allows getting to the event's website (if any) for booking tickets or getting more</p>

	information.
Online Practical Information	Internet-based practical information mainly on local transport, public transport, opening times of museums, public offices and shops. Apart from the possibility of be redirected to the relevant websites, it also provides “traditional” contacts, such as telephone numbers.
e-Forums	<p>One of the e-services suggested and requested by all the three categories are e-forums. In particular, tourists and residents point out that they appreciate to leave messages and recommendations based on their special needs, to get information and to interact in forum’s discussion. In addition, they would appreciate services, which make it easier to get in contact with authorities. On the other side, stakeholders discussed about the opportunity of analyzing users’ behaviour, requirements and expectations, in order to personalize their offer according to special needs. This indicates that e-forums should be on of the attributes of the conjoint experiment to be developed in task 1.4. However, these results are very important also for the development of task 4.4 about the e-governance system, because they indicate an effective need from all the three categories (residents, tourists and stakeholders), giving also important indications on the direction to take in the development of the e-participation process. Some of the stakeholders stated that they did not know which kind of e-services (and they did not give any practical examples) could be used to enhance participation of people in the cultural sector. This suggests the importance of constructing an e-participation system, taking into consideration also the decision-makers opinions.</p> <p>An e-forum can be implemented as an Internet-based chat-room, which enables the users to exchange messages, files and video stream. The main purpose of the e-forums for the cities’ residents is to establish a dialogue with local authority, others residents and to share practical information about the city. In the case of tourists the e-forums aim at providing recommendations on the city and interacting between tourists (exchanging hints, opinions, and highlights)</p>
Blogs	An Internet-based on-line diary that can be kept either privately or opened to all viewers (usually exists in its latter form). Using the blog

	users do not engage in the direct dialogue, but rather post their comments to someone's article. Similar to e-forums, blogs can be important in describing some "insiders' hints" about the city for potential visitors, helping tourists to share their impressions on the city with the others, as well as helping local residents to discuss the events and issues within the city.
Advertising on event	This service allow to advertise users on the upcoming events in the city that can be done on large screens on public places around the city, but also on screens in public transport and tourist sites.
Virtual Tours	Guided tours of the city using either virtual maps or virtual presentation of the city (recreated on the computer using the computer graphics). The potential visitors can see the city or at least get an idea about it without leaving their living room. Some virtual tours are delivered on PSP devices (gaming consoles) and mobile phones.
GPS and PDA Systems (info delivery)	Creating linkages between mobile devices (PDA, mobile phone, etc.) and GPS are seen by the participants as an interesting manner to create interactive and personalized tourism services. For example, this would enable a tourist to obtain information about the building he or she is passing by on the mobile phone or PDA. Live webcams could also form a source of information, for example, about cues in front of a particular museum. Delivering tourism-related information (podcasts, virtual tours or audio or video guides) on PDA that city's visitors either bring with themselves or rent from the tourism information offices around the city. PDA represent portable digital media devices that can also connect to the Internet via Wi-Fi network for getting travel updates

According to the previous schema, the following table indicates for each service identified the city in which it has been required from the actors involved in the three different phases of the focus groups.

Note that in this table different colours are used. The lines in green identified e-services common to the three cities involved, while the light-red colour means that the corresponding e-service has not

been required in all cities but it can be in any case considered very relevant for the ISAAC project objectives.⁵

ID	e-service	Amsterdam	Leipzig	Genoa
01	Interactive Maps	X	X	X
02	Thematic Search	X	X	
03	Profiling	X	X	X
04	Booking system (one stop-shop)	X	X	X
05	Journey Planner	X	X	X
06	Wi-fi system	X		
07	Event Calendar	X	X	X
08	Podcasts/downloads	X	X	
09	Webcam system	X		X
10	Guided Tours		X	
11	Kiosks	X	X	
12	Informative Desks			
13	Children dedicated website			
14	On-line practical information (transport, timetables, etc.)	X	X	X
15	On-line information on highlights (videos, pictures)		X	X
16	e-Forum	X	X	X
17	Blogs	X	X	X
18	Advertising on events	X	X	X
19	SMS Alert on highlights			
20	Virtual tours	X	X	X
21	Radio broadcasting			
22	Integrated system home (alerting with tailored information)			
23	Video reconstructions of the city		X	X
24	City wikipedia	X		
25	Video screens on public transports/spaces	X	X	

⁵ See ISAAC Annex I – “Description of Work”, pp. 14-15

ID	e-service	Amsterdam	Leipzig	Genoa
26	One tourist/resident portal	X	X	
27	GPS system	X	X	X
28	PDA systems (info delivery)	X		X
29	TV broadcasting		X	X
30	Second life game	X		
31	Tourists satisfaction questionnaire			
32	On-line city offices/e-governance systems			
33	Satisfaction charts			

The need for integrated e-services is different in the 3 cities and some e-services where only mentioned in one of the cities. However, the focus groups results converge on a limited set of e-services and their characteristic that are regarded important by most of the respondents' categories in each city. These e-services, or better their integration to provide more advanced ones, are at the basis of the possible conjoint choice scenarios suggested at the end of this document. In this way such packages of e-services can be ranked and we can have both WTP per each service and for alternative packages.

The following table gives an evaluation of the e-services common to all cities user requirements. These set of e-services will compose the core of the ISAAC ICT platform that will be developed within the end of the project.

Note that each e-service is classified in term of:

- feasibility from a technical point of view
- usability from a user perspective,
- affordability from a user perspective,
- accessibility from a user perspective,
- development importance,
- dependencies between services provided

The evaluation column represents the kind of criteria that will be applied at testing time on each service by identifying the type of evaluation that will be done on the prototype.

ID	e-service	Priority*	Dependencies	Evaluation**
01	Interactive Maps	H	27	T/U
02	Thematic Search	L	-	U
03	Profiling	H	-	U
04	Booking system (one-stop shop)	H	01,03,07,14	U
05	Journey Planner	H	01,03,07,14,27	U
07	Event Calendar	H	-	U
14	On-line practical information (transport, timetables, etc.)	H	-	U
16	e-Forum	M	-	U
17	Blogs	L	-	U
18	Advertising on events	M	-	U
20	Virtual tours	M	07,03	U
27	GPS system	H	-	T
28	PDA systems (info delivery)	H	01,05,27	T

* H = high priority, M = medium priority, L = low priority

** T = test, U = user

As you can see in the above table, some e-services are depending from other services. The dependencies are derived from the different scenarios identified in the Task 1.3 as input for the future conjoint analysis to be done during the Task 1.4 activities (see Report D1.3 –chapter 6). These integrations of e-service and the corresponding scenarios give some preliminary ideas that will be studied more in depth during the Task 1.4. The results of this task will be the input for the design and specification for ISAAC e-services in the Task 2.2 and will be collected on the corresponding report D2.2 “Report on ISAAC e-services and architecture specifications” to be done within Month 11.

4 Conclusions

This report aimed to give an overview from a technical point of view of the user requirements gathered from the Work Package 1 activities and will be the starting point for the Work Package 2 work on the design and development of the ISAAC ICT platform.

The result of this report has been a set of user requirements and e-services that will constitute the base for the future design of the ISAAC Integrated Platform.

The following technology innovation challenges will be key to the future development of ISAAC:

- To create a system with which users can experience the advantages enjoyed by tourists without visiting the physical locations concerned. This will not only assist social and cultural inclusion, but also enhance engagement with cultural heritage and thus enhance empathy, willingness to conserve, and visitation generally.
- Provide a vital service to researchers in that relevant and practical links are provided between related pieces of information. In turn, the intelligent technology and reasoning components will track links created as part of the research journey, adding to the overall intelligence structure.
- Develop associations and harmonization between cultural heritage sites, resulting in commercial and academic gains for those in collaboration.
- Provide a common framework for all users standardizing the interface and representational characteristics of a large variation of cultural heritage attractions, environments and goods.
- Apply knowledge modelling and cognitive reasoning techniques to the information base to create links between context-associated information to support either manual or automated decision-making processes.
- Maintain links between cultural goods and information throughout the information base using links gathered through analysis of the activities (tourist or research) taking place during use of the system.
- Allow User Profiling and individual customization maintenance to be controlled by the intelligent agent system.
- Create a framework extending interface components from common PC-based applications to homogeneous machine-independent platforms, for each level of the interface; software- (e.g. Web-browser), operating system- and machine-level.

- Apply state-of-the-art techniques used in mobile agent technology to allow necessary intelligence feedback for individual users or organizations to be independent of location.

The above require that the ISAAC platform needs to develop around one central integrated portal that could satisfy all information needs about cultural heritage and in addition provide possibilities for booking a ticket, printing a route planner, having a personal agenda, time planners, stakeholder blogs and forums. This web portal will be the core of the ISAAC integrated platform that will provide, by using different technologies' combination, some of the following set of e-services, identified as the core of the future ISAAC platform functionalities in terms of novelty, business models, targeting of specific user groups and so forth:

ID	e-service
01	Interactive Maps
02	Thematic Search
03	Profiling
04	Booking system (one-stop shop)
05	Journey Planner
07	Event Calendar
14	On-line practical information (transport, timetables, etc.)
16	e-Forum
17	Blogs
18	Advertising on events
20	Virtual tours
27	GPS system
28	PDA systems (info delivery)

The next steps will be to translate the results from this analysis with regard to service, technology and heritage interpretation preferences in the detailed specification of the ISAAC integrated platform.

Alternative implementation scenarios will be identified in Task 1.4 “Users requirements for ISAAC e-services using conjoint analysis”, while the content management issues in term of taxonomy of cultural heritage goods will be provided by Task 1.5 “European indexing of cultural heritage goods and services”.

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